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Chip Prices as a Proxy for Nonsawtimber Prices in the Pacific Northwest

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Abstract

The heavy focus on Pacific Northwest saw-log prices makes it difficult for land managers to develop price expectations for stands that contain both sawtimber and nonsaw-timber logs. This raises the question: What is a reasonable proxy (or measure) for non-sawtimber prices in the Pacific Northwest? One such proxy is export chip prices, which serve as a reasonable measure of value in three ways. First, they reflect the underlying trends in all chip markets. Second, they reflect expected patterns of market arbitrage. Third, they help to explain seasonality and cyclical variation in the chip market.

Keywords: Prices, stumpage, nonsawtimber, sawtimber, proxy, chip prices.

Introduction

Unlike other regions in the United States, the Pacific Northwest forest sector is perceived as an almost exclusively sawtimber market.[1] That is, most of the timber harvested is sold and reported in terms of saw logs–logs larger than 11 inches in diameter and destined for one of several types of solidwood forest products mills. The notions of value that drive land stewardship and industrial decisions in the Pacific Northwest are based on price expectations for stumpage (saw logs) and lumber such as those shown in figure 1. This figure shows two strong periodic increases in stumpage prices. The first period follows World War II and reflects price adjustments due to abolishing wartime price controls and to the 1950s housing boom. The second period starts in the mid-1960s and reflects both increased volatility (as part of the overall volatility in commodity markets, including large changes in energy prices in the 1970s) and upward trends in prices (resulting from overall price inflation and increased housing demand). The average rate of real price[2] increase for saw-log stumpage shown in figure 1 is 3.9 percent per year for the 87-year period.

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[1] Timber markets are characterized differently in different regions but generally a complete typology would include four broad components for groups of softwood and hardwood species. These four groups are two roundwood (sawtimber and nonsawtimber) and two residue (mill and other) components. Most actual price reporting focuses on major regional markets for specific components, such as softwood roundwood nonsawtimber (or pulpwood) in the South, softwood sawtimber in the Pacific Northwest, and hardwood sawtimber in the Northeast.

[2] Real prices refer to prices that have been adjusted for inflation (in this case, using the Producer Price Index).

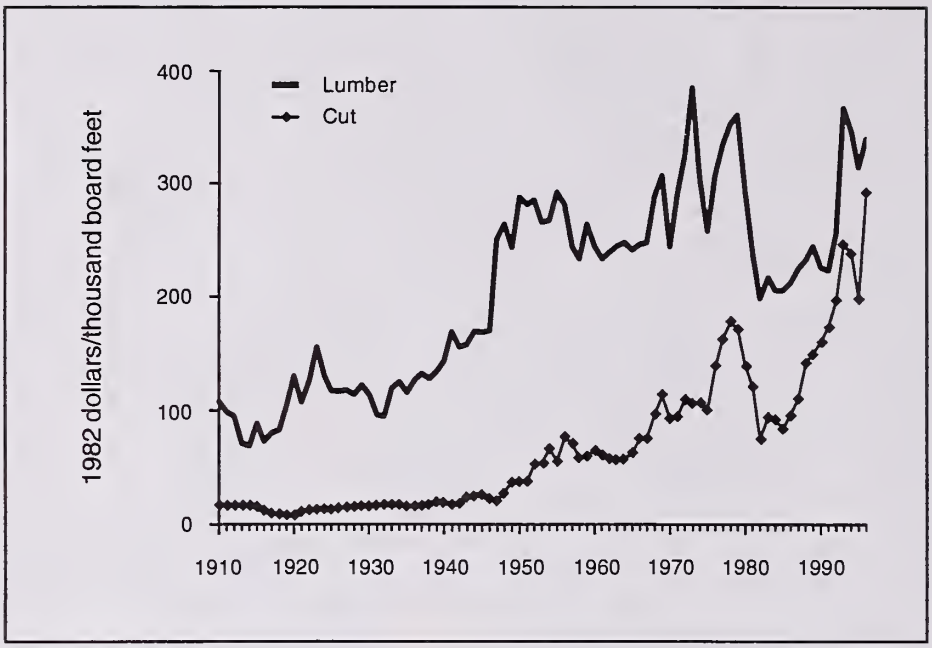

Figure 1—Lumber and stumpage prices, 1910-97.

The focus on saw-log prices (derived from logs used for lumber, plywood, poles, and export) makes it difficult to develop price expectations for mixed stands that contain both sawtimber and nonsawtimber logs. Nonsawtimber logs smaller than 11 inches in diameter have long been part of the log mix, but the perception of their increasing share of the market in the last decade has raised concerns about how to develop price expectations. Such price expectations are key to assessing the likelihood that a timber sale will be sold either for final harvest or as an opportunity to implement silvicultural prescriptions through the use of timber sales. What is a reasonable basis for developing price expectations for stands that contain a wider array of potential log sizes smaller than sawtimber? While there are widely available sawtimber prices, what measures of nonsawtimber prices are available to help shape perceptions about the value of small-diameter stands?

An array of products can be made from nonsawtimber, including those using chips, such as pulp and paper. While the Pacific Northwest has a long history of reported prices for sawtimber (see fig. 1), it has no conventionally accepted price series for nonsawtimber markets. Without a direct price measure, proxies for nonsawtimber markets, such as chip prices, need to be evaluated for possible use.

The purpose of this research note is to examine the available continuous price measures of a nonsawtimber commodity that can serve as a proxy for nonsawtimber prices. The most readily available price measure is for chips. In figure 2, two measures of chip prices plus the sawtimber price from figure 1 are shown. As a caution, sawtimber prices are reported as stumpage (standing timber) while chip prices are typically reported as delivered prices (to mills, chip yards, etc.) and reflect stumpage, logging, and hauling costs. As a general observation, the various prices differ but share the same general upward trend during the 1968-96 period (roughly 2 percent per

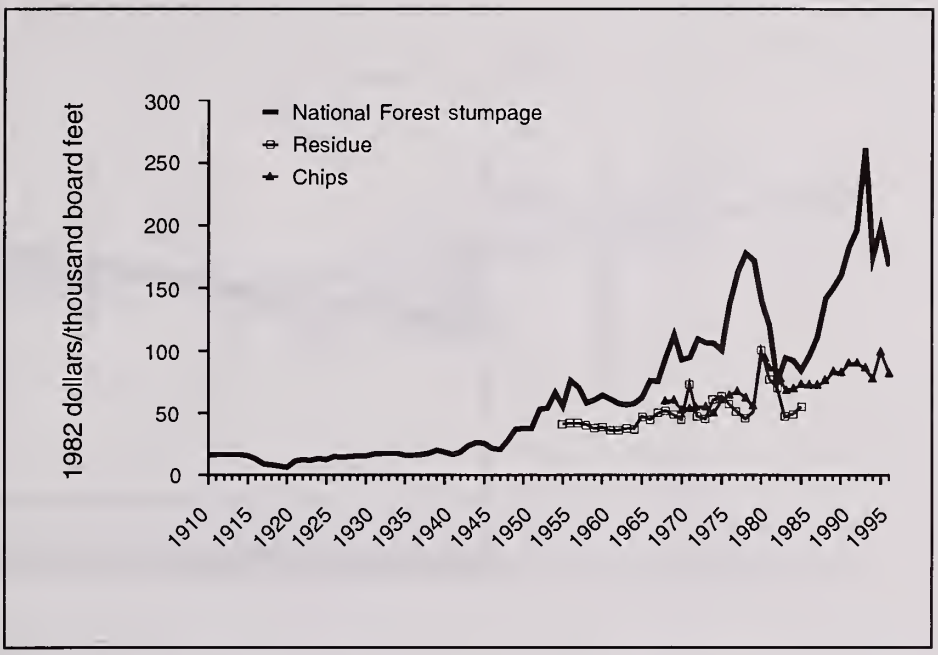

Figure 2—National Forest stumpage, residue, and chip prices for the Pacific Northwest.

year). This observation raises a number of questions, such as what are the trends, what is the relation between chips and sawtimber, and what is the relation between the two types of chips prices? These issues will be addressed in this research note.

Chip Prices

The only long-term continuously reported chip prices for the Pacific Northwest are for the export market, which have been reported since 1968 in various issues of "Production, Prices, Employment, and Trade in Northwest Forest Industries" (see, for example, Warren 1997). The volume, nominal price data, and the real price data for the two customs districts[3] and the average for the Pacific Northwest are in the appendix, tables 1 through 12.

In some respects export chip prices may not be a useful proxy. The experience in the saw-log market suggests that the export market is differentiated by increased handling, generally higher quality standards, and various forms of trade barriers, which contribute to price premiums for export logs (see Flora and others 1993 for a discussion of these differences and for estimates of price premiums in the export log market). Although these differences lead to concerns about the relations between domestic and export prices, I believe that export chip prices serve three useful roles. First, they reflect the underlying trends in all chip markets including the emerging market for fiber logs. Second, in peak markets, prices in the export and domestic markets are arbitraged against each other so that export prices represent some type of higher bound to chip prices. Third, these export prices help explain seasonality and cyclical variation in the chip market.

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[3] Trade data are commonly summarized to groupings of individual ports called customs districts. The two customs districts of greatest interest in the Pacific Northwest are the Seattle and Columbia-Snake Customs Districts.

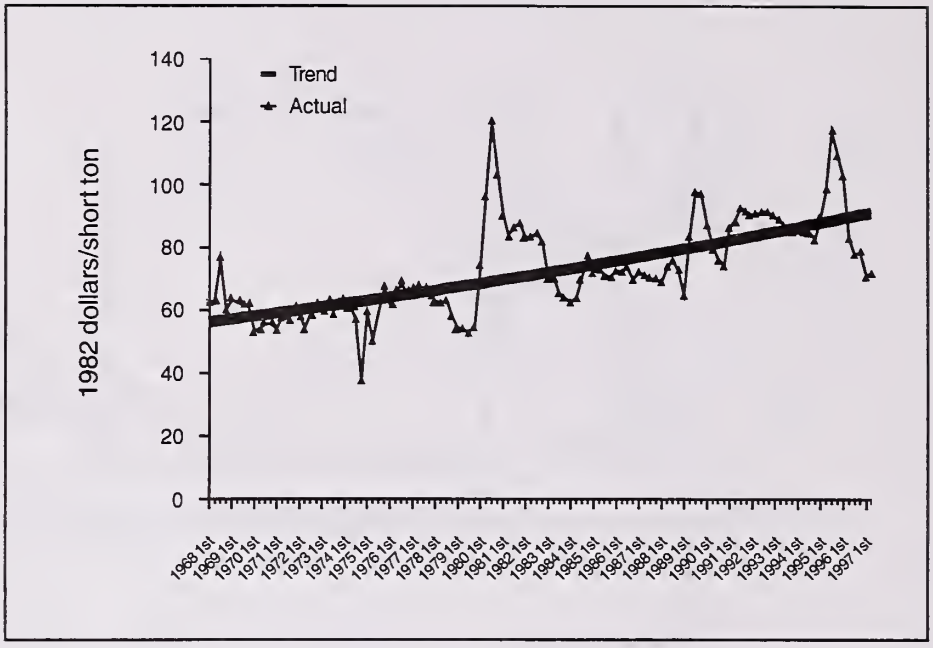

Figure 3—Price trend for chip exports from the Columbia-Snake Customs District.

Trend in Prices

In past market assessments, Pacific Northwest chip markets have been treated in scant detail but the general assumption has been that domestic chip markets exhibit no real price trend (see Haynes and others 1995). In terms of figure 1, that means the plot of prices is flat for the period in question. However, chip price data from the customs districts illustrate an upward trend (2 percent per year for the Columbia-Snake Customs District and 1.6 percent per year for the Seattle Customs District) in the two markets when measured during the 30 years for which data exist (see figs. 3 and 4).

These results are somewhat deceptive because figures 3 and 4 illustrate a lack of uniformity in price movements. There seems to be two general plateaus in the chip price series: 1968-79 and 1980-96. In the economic literature this type of trend break often reflects an underlying structural shift in some relation between the two periods (Cogley 1997). In this case the structural shift could be due to the deep recession that started in 1980 and fundamentally altered cost structures in U.S. producing regions. This hypothesis is often tested by using a Chow test for the equality of coefficients in two relations for the period in question (Chow 1960). In this case there is a significant break in the data, reducing the trend by roughly half to 0.9 percent per year for the Columbia-Snake Customs District and to 0.3 percent per year for the Seattle Customs District.

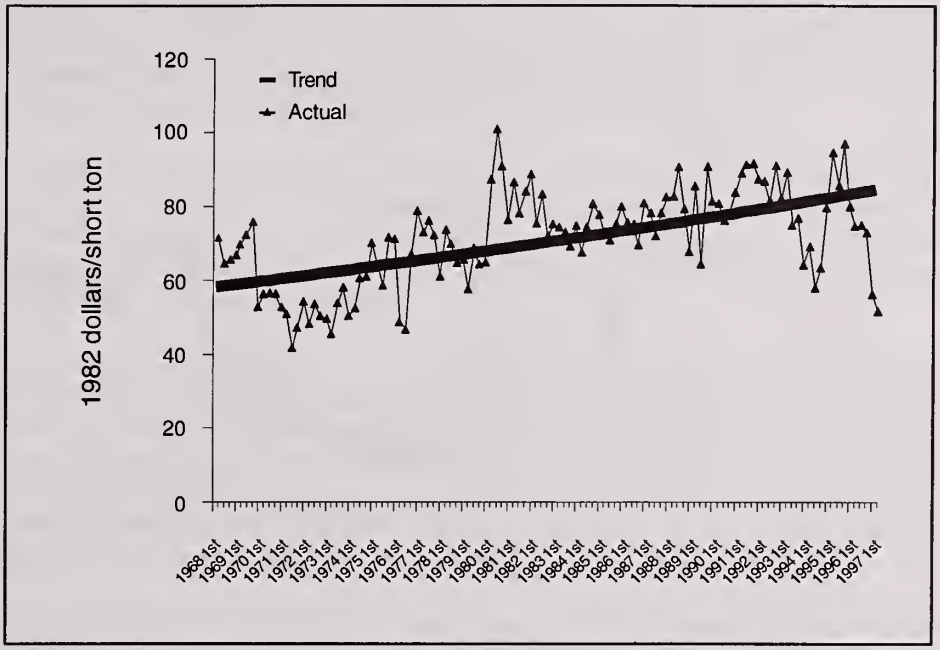

Figure 4—Price trend for chip exports from the Seattle Customs District.

As can be seen from figure 1, this pattern generally corresponds to similar movements in the sawtimber stumpage market, except in the 1980s when market prices fell and chip prices rose. This reflects two general underlying trends. First, since chips often are manufactured from mill residues, the drop in lumber production in the early 1980s led to a sharp increase in chip prices during a time when stumpage prices fell to low levels. Second, since the major export chip market is in Japan, it is necessary to consider how price increases expressed in dollars are viewed by consumers who saw chip prices expressed in yen. Figure 5 illustrates this trend and shows that between 1984 and 1996 U.S. and Japanese consumers of chips received different price signals largely because of changes in the yen-per-dollar exchange rate. During this period, Japanese consumers saw U.S. chip prices decline 28 percent while U.S. consumers saw prices for the same chips rise 52 percent. The relative change in the value of currencies potentially increases demand for these products in foreign markets, keeping prices high when U.S. demand might be low.

In closing, there are trends in the export chip price data that are related to underlying differences in how price changes are perceived by different groups (in this case, nationalities) of consumers. These trends in recent years have been modest (compared to the 1970s), but upward.

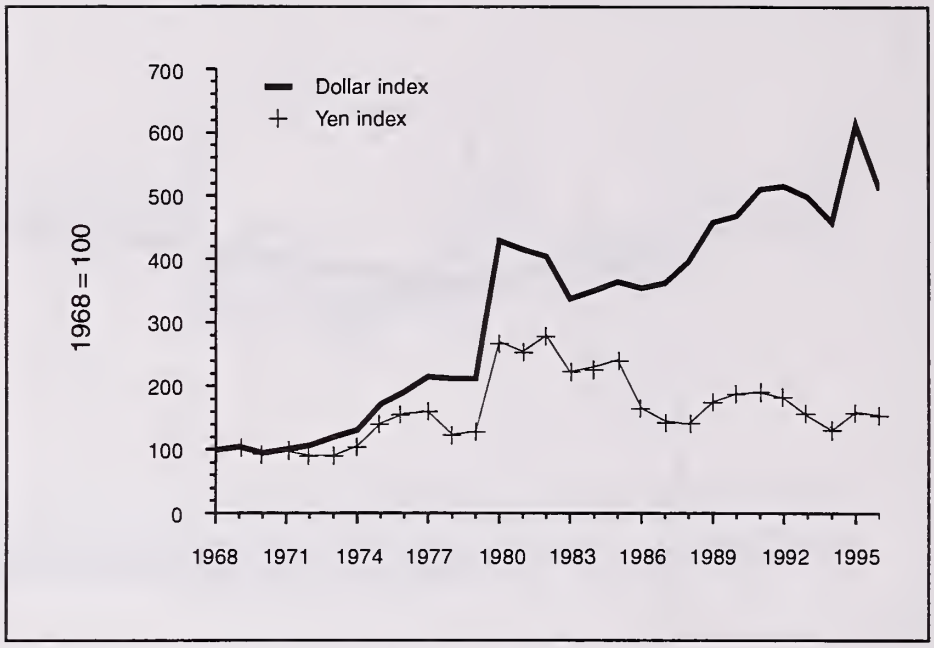

Figure 5—Chip prices as seen by U.S. and Japanese consumers.

Arbitrage Between Domestic and Export Markets

In general, domestic chip prices (labeled "residue" in fig. 2) illustrate many of the same trends as those for the export market, suggesting that the two markets share related underlying determinants (see fig. 2). The limited domestic chip price series was developed from data collected from sawmills that purchased Forest Service timber. The prices are for chipped mill residues and reflect a condition known as clean chips (because they contain no bark or dirt). These data were used in support of the Forest Service timber appraisal process, which included residue prices as part of potential mill realizations (the total value that a mill receives from a timber sale). The data were summarized and reported by Adams and others (1988). These residue prices are no longer available because appraisal methods changed in the late 1980s.

Conventional thinking in the Pacific Northwest is that the export and domestic chip markets coincide only at peak market periods. This reflects the proposition that the export market shows longer term market prices for a relatively high-quality product, whereas the domestic market is a mix of long-term contracts, spot markets (some of which is exported), and mixed quality (and species) product. The available price data suggest a fixed relation[4] between the two markets where the domestic price is about 80 percent of the export price. There is also little evidence (see fig. 2) that the markets coincide only in peak market periods. The relation (except in 1971) seems to be fairly consistent. This does not change the notion that export prices might set some type of limit but it does reduce the utility of such notions. While not in a definitive fashion,

[4] In the pricing literature, these are called marketing margins (Haynes 1977) and they serve as a general source of information about the nature and extent of the implicit relation between different markets (or different market levels). The relation is export chip prices equal 5.9 plus 0.8 times domestic chip prices.

these results support the proposition that export chip prices are a reasonable proxy of all chip prices because there seems to be consistent market arbitrage occurring in different aspects of the chip market. Additionally, differences in prices represent different underlying cost structures rather than artificial barriers.

Seasonality and Cycles

Forest products price data are generally reported without seasonal adjustments. The issue of seasonality in various stumpage and lumber markets was examined by Haynes (1991) and Sohngen and Haynes (1994). In general, we found seasonal patterns in the quarterly data that affects intrayear comparisons among quarters, but no evidence of cyclic patterns in the annual data.

In general, a price series has four components: trend, cycle, seasonality, and randomness. The trend component suggests whether prices generally increase or decrease over time. The cycle component relates to the business cycle in general; for example, some component of price is determined by the general level of economic activity at the time. Seasonality is a component causing prices to be higher or lower during certain times of the year. Randomness represents all that cannot be explained by the other three components.

The process for determining seasonality was taken from Pindyck and Rubinfeld (1981). From the continuous data (1968-96) for the Columbia-Snake and Seattle Customs Districts, final seasonal adjustments for the four quarters are:

Quarter	Columbia-Snake	Seattle	PNW average
First quarter	0.986	0.999	0.999
Second quarter	.993	.996	.998
Third quarter	1.022	.986	1.010
Fourth quarter	.994	1.021	1.000

These indices show a modest amount of seasonality similar to what was found in the stumpage and lumber markets in the Pacific Northwest (see Haynes [1991] and Sohngen and Haynes [1994]). The empirical evidence shows only a small amount of long-term trend in the price data, because the sum of the seasonal indices is nearly 4.00. The implication is that the volatility in the chip price data seems to be due to long-term cyclic trends in the market. The cyclic trends that affect chip markets may be similar to slumps in overall economic growth. Seasonally adjusted price data are in the appendix, tables 13, 14 and 15.

Fiber Log Prices

Although chip prices continue to serve as a proxy for the value of nonsawtimber, prices are now being reported for fiber logs in addition to prices for chips derived from mill residues. Fiber logs are a mix of logs averaging 5 inches in diameter and larger. Stands considered to be predominantly fiber stands average roughly 8 inches in diameter where sawtimber stands average at least 11 inches in diameter. Fiber log prices are typically expressed on a per ton basis delivered to mills. Prices for saw logs and fiber logs in northeastern Oregon[5] during 1994-97 were:

Year	Saw logs	Fiber logs
	Dollars per thousand board feet	
1994	411	140
1995	343	174
1996	318	132
1997	277	128

Fiber log prices generally follow sawtimber prices but there are few comparable price series to provide a more definitive view. As shown here, both types of timber share the same downward trend (roughly a 25 percent drop from the high prices in 1994-95 to the 1997 level) although there are differences in the 1994-95 period.

Discussion

Changes in the chip markets are interesting in their own right, but they also play an important role as a proxy for what is happening in broader timber markets. Interest in chip prices has increased dramatically in the 1990s as harvests shift into generally smaller diameter second-growth stands. For example, in western Oregon and Washington, the average diameter of harvested stands on private timberland fell 35 percent (nearly 3 percent per year) between 1976 and 1991 (Haynes and others 1995). Recently, relative changes in both average stand diameter and sawtimber-fiber log markets have created confusion about the feasibility of various silvicultural practices being implemented using timber sales[6] as the means for achieving desired future conditions for contiguous sets of stands. One management question has become: What is the minimum sawtimber fraction in stands that will sell using traditional timber sales?

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[5] These prices are reported in the "Blue Mountain Renewable Resources Newsletter," published quarterly by the Oregon State Extension Service in La Grande, Oregon. Fiber log prices were converted from a per ton basis to a thousand board feet (MBF) basis by the conversion factor 1 MBF = 4.254 tons (of selected species common in the Blue Mountains of Oregon).

[6] On public lands, timber sale contacts are still the primary way land managers have to implement both final harvest and intermediate treatments, such as thinning, as well as to restore function and process at the stand level.

The extent of the problem of designing and offering timber sales with a high likelihood of selling can be illustrated from these fiber log prices. Assuming logging costs of $115 per thousand board feet, one can compute the minimum sawtimber fraction of stands in northeastern Oregon that will sell, and that the value of those stands will equal or exceed the costs of logging them. This amount ranged between 20 and 33 percent during 1994-97[7] and exemplifies some of the difficulty recently experienced in designing sales that can be sold. For example, a sale designed in 1995 needed only 20 percent sawtimber in order to sell, but a sale in 1997 needed 33 percent sawtimber to sell.

A final discussion point is the relation of chip prices in the Pacific Northwest with those in Alaska (real prices for the Anchorage Customs District are shown in the appendix, table 12). As is argued elsewhere (Haynes and Brooks 1990), prices in Alaska for stumpage are arbitraged against those in the Pacific Northwest because both regions share many of the same markets. The price data for the last 25 years suggest little actual relation between chip prices in Alaska and the Pacific Northwest. This reflects a divergence between types of pulp markets. The two operating pulp mills in Alaska produced only dissolving pulp while mills in the Pacific Northwest produced standard pulp. Another suggestion is that chip prices in the Pacific Northwest are related more to lumber prices than to pulp prices, and chip prices in Alaska are related more to pulp prices than to lumber prices. Finally, the recent closure of both pulp mills in southeastern Alaska may lead to closer relations between chip markets in the Pacific Northwest and Alaska.

Conclusions

Earlier, the question was raised: Are export chip prices a reasonable proxy of nonsaw timber values? The preceding discussion, although lacking a definitive test, suggests that export chip prices provide a useful proxy for nonsawtimber values in understanding trends and seasonal issues. This judgment is based on both the empirical relations between export and domestic chip prices in the Pacific Northwest and the more subjective evaluation of the how underlying market trends have affected sawtimber and nonsawtimber markets differently.

Finally, several general statements can be made about chip markets. First, there are long-term upward price trends in the chip price data. This rate of increase has slowed in recent decades and it is considerably less than for sawtimber. Second, there is a rough fixed relation between the domestic and export chip markets. These results support the proposition that export chip prices are a reasonable measure of all chip prices because there seems to be consistent market arbitrage occurring in different aspects of the chip market. Third, these indices show a modest amount of seasonality, similar to what has been found in the stumpage and lumber markets in the Pacific Northwest.

Acknowledgments

Judy Mikowski developed the various data summaries from data compiled by Debra Warren.

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[7] This is computed from the identity: fiber price (1-sawtimber fraction) + sawtimber price (sawtimber fraction) = logging costs.

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Appendix

Table 1—Volume of chips, by quarter, exported from Columbia-Snake Customs District

Year	Quarter			
	1st	2d	3d	4th
	Short tons			
1968	216,283	279,302	332,723	274,361
1969	369,751	262,584	358,644	469,690
1970	341,081	284,156	547,348	432,477
1971	457,107	393,780	21,175	632,107
1972	407,946	460,451	557,985	654,650
1973	586,999	662,377	779,110	750,343
1974	820,051	778,340	784,043	795,031
1975	449,090	576,832	749,255	661,630
1976	735,027	764,881	708,615	673,054
1977	643,794	723,641	799,343	725,464
1978	629,826	734,066	661,431	625,100
1979	691,511	807,820	870,537	755,235
1980	737,661	767,411	716,415	628,440
1981	715,962	443,236	463,096	454,318
1982	502,602	475,798	500,303	435,736
1983	400,690	441,218	438,092	388,971
1984	392,085	441,888	418,463	380,379
1985	422,788	416,802	393,944	392,956
1986	325,281	407,330	376,420	468,708
1987	349,730	451,497	566,455	485,238
1988	393,460	579,809	467,338	575,381
1989	534,906	577,542	602,796	537,038
1990	539,181	490,154	553,988	497,876
1991	498,680	550,492	585,496	507,047
1992	459,378	463,320	434,875	408,928
1993	379,056	397,364	347,428	421,056
1994	337,688	316,109	486,706	378,269
1995	316,713	314,730	294,622	403,525
1996	293,471	322,151	289,676	325,668
1997	277,599	318,235	--	--

-- = not available.

Table 2—Nominal value of chips, by quarter, exported from Columbia-Snake Customs District

Year	Quarter			
	1st	2d	3d	4th
	Dollars per short tons			
1968	20.35	20.67	24.92	19.95
1969	21.19	21.09	20.89	21.21
1970	18.50	18.94	19.59	19.83
1971	19.42	20.92	21.02	22.07
1972	21.83	20.47	22.25	23.34
1973	23.57	25.21	24.06	26.35
1974	27.04	29.70	29.22	20.13
1975	33.55	29.25	35.15	39.85
1976	37.06	40.20	41.92	40.90
1977	42.42	43.96	43.49	43.32
1978	42.38	43.35	44.42	41.62
1979	40.73	41.61	42.35	45.45
1980	63.71	85.88	109.10	97.05
1981	87.17	82.55	85.77	86.90
1982	83.30	83.38	84.57	81.80
1983	70.19	70.65	66.44	65.22
1984	64.65	66.57	73.42	79.86
1985	74.53	75.91	73.39	72.90
1986	73.95	72.12	73.23	69.62
1987	72.62	72.85	72.69	72.82
1988	72.31	77.90	82.09	78.88
1989	72.16	94.01	109.63	109.64
1990	99.78	98.92	94.26	90.31
1991	101.30	103.02	107.71	106.47
1992	104.92	106.64	108.26	107.71
1993	106.71	105.71	102.97	101.81
1994	101.98	102.68	103.70	101.07
1995	110.66	123.67	147.29	137.62
1996	129.50	105.73	98.92	100.89
1997	91.61	92.08	--	--

-- = not available.

Table 3—Real value of chips, by quarter, exported from Columbia-Snake Customs District

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short tons			
1968	62.36	63.03	75.91	60.21
1969	63.13	62.40	61.50	61.65
1970	53.31	53.96	55.50	55.55
1971	53.94	57.47	57.12	59.81
1972	58.53	54.30	58.71	61.26
1973	60.75	62.87	59.26	63.19
1974	60.90	61.75	56.85	37.98
1975	58.67	50.60	59.54	66.78
1976	61.79	66.06	68.07	65.81
1977	66.79	67.59	66.79	65.75
1978	62.80	62.37	62.94	57.66
1979	54.45	53.72	53.02	54.96
1980	73.62	97.29	119.64	104.03
1981	90.73	84.01	86.70	87.93
1982	83.30	83.38	84.57	81.80
1983	69.92	70.14	65.33	63.82
1984	62.56	63.99	70.74	77.15
1985	72.18	73.42	71.49	70.57
1986	72.68	72.24	73.71	69.83
1987	71.99	71.08	70.13	69.93
1988	69.06	73.19	76.07	72.74
1989	65.05	83.40	97.57	97.17
1990	87.83	80.75	76.72	74.11
1991	86.36	88.86	92.72	91.42
1992	90.55	90.91	91.51	91.07
1993	89.92	88.34	86.53	85.77
1994	85.77	85.59	85.28	82.66
1995	89.05	98.02	116.90	109.72
1996	102.45	83.06	77.77	78.82
1997	71.07	71.99	–	–

-- = not available.

Table 4—Volume of chips, by quarter, exported from Seattle Customs District

Year	Quarter			
	1st	2d	3d	4th
	Short tons			
1968	–	46,280	31,680	34,171
1969	23,760	39,233	53,756	43,416
1970	61,424	64,537	49,590	63,206
1971	59,559	76,562	36,897	56,219
1972	36,756	29,150	50,680	52,139
1973	41,356	45,791	71,302	113,747
1974	77,205	78,449	108,159	126,557
1975	112,651	72,668	80,695	60,069
1976	73,962	134,988	173,302	75,549
1977	74,676	53,535	76,622	76,707
1978	95,285	59,858	39,786	104,211
1979	55,907	114,584	77,179	98,539
1980	21,508	123,993	31,697	90,905
1981	49,140	79,290	60,004	108,027
1982	83,962	64,361	74,513	105,538
1983	69,722	64,243	77,917	36,053
1984	58,862	45,002	77,700	34,525
1985	67,551	54,056	103,586	50,861
1986	91,810	58,676	111,582	184,158
1987	84,041	108,308	148,451	123,626
1988	159,794	177,621	168,256	176,140
1989	198,897	206,821	236,547	158,298
1990	156,525	236,160	181,488	170,224
1991	225,541	120,991	154,151	180,368
1992	142,730	151,791	164,030	124,591
1993	173,528	125,783	174,342	114,912
1994	165,675	129,913	268,569	191,716
1995	90,506	138,652	158,401	155,135
1996	141,570	170,023	124,553	153,842
1997	159,662	211,179	–	–

-- = not available.

Table 5—Nominal value of chips, by quarter, exported from Seattle Custom District

Year	Quarter			
	1st	2d	3d	4th
	Dollars per short ton			
1968	–	23.37	21.17	21.70
1969	22.44	23.74	24.75	26.06
1970	18.41	19.79	19.95	20.13
1971	18.98	18.43	15.35	17.57
1972	20.20	18.20	20.23	19.21
1973	19.29	18.30	21.93	24.13
1974	22.36	25.29	31.12	32.37
1975	39.95	37.21	34.74	42.72
1976	42.66	29.65	28.85	41.40
1977	49.86	47.54	49.36	47.56
1978	41.31	50.99	49.05	46.72
1979	49.83	44.80	54.00	53.18
1980	56.29	76.67	91.79	84.65
1981	73.54	84.91	77.61	82.69
1982	88.46	75.43	83.00	71.67
1983	75.40	74.74	74.34	70.86
1984	77.03	70.40	77.69	83.29
1985	80.40	75.52	73.03	77.60
1986	81.31	75.47	74.58	69.48
1987	81.47	80.10	74.77	81.64
1988	86.24	87.99	97.59	85.24
1989	75.53	96.11	72.52	102.05
1990	92.54	98.58	93.88	95.72
1991	98.41	103.30	106.01	106.38
1992	101.32	101.68	96.23	107.39
1993	97.20	106.57	89.29	90.89
1994	76.61	82.57	70.70	77.58
1995	99.36	118.97	108.25	121.32
1996	100.76	95.11	94.90	93.38
1997	72.32	66.08	–	–

-- = not available.

Table 6—Real value of chips, by quarter, exported from Seattle Customs District

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1968	--	71.24	64.46	65.49
1969	66.85	70.24	72.86	75.75
1970	53.05	56.38	56.52	56.39
1971	52.72	50.63	41.71	47.62
1972	54.16	48.28	53.38	50.42
1973	49.72	45.64	54.01	57.87
1974	50.36	52.58	60.54	61.08
1975	69.86	64.38	58.84	71.59
1976	71.13	48.72	46.84	66.62
1977	78.50	73.09	75.80	72.18
1978	61.22	73.36	69.50	64.73
1979	66.62	57.84	67.61	64.31
1980	65.05	86.86	100.66	90.73
1981	76.54	86.41	78.45	83.67
1982	88.46	75.43	83.00	71.67
1983	75.11	74.20	73.10	69.34
1984	74.54	67.67	74.86	80.46
1985	77.86	73.05	71.14	75.12
1986	79.91	75.60	75.07	69.69
1987	80.76	78.15	72.14	78.40
1988	82.36	82.66	90.44	78.60
1989	68.09	85.26	64.54	90.45
1990	81.46	80.47	76.41	78.54
1991	83.82	89.10	91.26	91.34
1992	87.45	86.68	81.34	90.80
1993	81.91	89.06	75.03	76.57
1994	64.43	68.83	58.14	63.45
1995	79.96	94.30	85.91	96.72
1996	79.72	74.71	74.61	72.95
1997	56.11	51.67	--	--

-- = not available.

Table 7—Volume of chips, by quarter, exported from Pacific Northwest customs districts

Year	Quarter			
	1st	2d	3d	4th
	Short tons			
1968	–	325,583	364,403	308,532
1969	393,511	301,817	412,400	513,106
1970	402,505	348,693	596,938	495,683
1971	516,666	470,342	58,072	688,326
1972	444,702	489,601	608,665	706,789
1973	628,355	708,168	850,412	864,090
1974	897,256	856,789	892,202	921,588
1975	561,741	649,500	829,950	721,699
1976	808,989	899,869	881,917	748,603
1977	718,470	777,176	875,965	802,171
1978	725,111	793,924	701,217	729,311
1979	747,418	922,404	947,716	853,774
1980	759,169	891,404	748,112	719,345
1981	765,102	522,526	523,100	562,345
1982	586,564	540,159	574,816	541,274
1983	470,412	505,461	516,009	425,024
1984	450,947	486,890	496,163	414,904
1985	490,339	470,858	497,530	443,817
1986	417,091	466,006	488,002	652,866
1987	433,771	559,805	714,906	608,864
1988	553,254	757,430	635,594	751,521
1989	733,803	784,363	839,343	695,336
1990	695,706	726,314	735,476	668,100
1991	724,221	671,483	739,647	687,415
1992	602,108	615,111	598,905	533,519
1993	552,584	523,147	521,770	535,968
1994	503,363	446,022	755,275	569,985
1995	407,219	453,382	453,023	558,660
1996	435,041	492,174	414,229	479,510
1997	437,261	529,414	–	–

– = not available.

Table 8—Nominal value of chips, by quarter, exported from Pacific Northwest customs districts

Year	Quarter			
	1st	2d	3d	4th
	Dollars per short ton			
1968	–	21.06	24.60	20.14
1969	21.27	21.44	21.39	21.62
1970	18.49	19.10	19.62	19.87
1971	19.37	20.51	17.42	21.70
1972	21.70	20.33	22.08	23.04
1973	23.29	24.76	23.88	26.06
1974	26.64	29.30	29.45	21.81
1975	34.83	30.14	35.11	40.09
1976	37.57	38.62	39.35	40.95
1977	43.19	44.21	44.00	43.73
1978	42.24	43.93	44.68	42.35
1979	41.41	42.01	43.30	46.34
1980	63.50	84.60	108.37	95.48
1981	86.29	82.91	84.83	86.09
1982	84.04	82.43	84.37	79.82
1983	70.96	71.17	67.63	65.70
1984	66.27	66.92	74.09	80.15
1985	75.34	75.87	73.32	73.44
1986	75.57	72.54	73.54	69.58
1987	74.33	74.25	73.12	74.61
1988	76.33	80.27	86.19	80.37
1989	73.07	94.56	99.17	107.91
1990	98.15	98.81	94.17	91.69
1991	100.46	103.07	107.36	106.45
1992	104.07	105.42	104.97	107.64
1993	103.72	105.92	98.40	99.47
1994	93.63	96.82	91.97	93.17
1995	108.15	122.23	133.64	133.09
1996	120.15	102.06	97.71	98.48
1997	84.57	81.71	--	--

-- = not available.

Table 9—Real value of chips, by quarter, exported from Pacific Northwest customs districts

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1968	–	64.20	74.91	60.79
1969	63.36	63.42	62.98	62.84
1970	53.27	54.41	55.58	55.65
1971	53.80	56.36	47.33	58.81
1972	58.16	53.94	58.26	60.46
1973	60.02	61.75	58.82	62.49
1974	59.99	60.91	57.30	41.15
1975	60.91	52.15	59.47	67.18
1976	62.65	63.46	63.90	65.90
1977	68.01	67.97	67.57	66.36
1978	62.60	63.20	63.31	58.67
1979	55.36	54.23	54.21	56.04
1980	73.38	95.84	118.84	102.35
1981	89.82	84.37	85.75	87.11
1982	84.04	82.43	84.37	79.82
1983	70.69	70.65	66.50	64.29
1984	64.12	64.33	71.39	77.42
1985	72.96	73.38	71.41	71.09
1986	74.27	72.66	74.02	69.79
1987	73.69	72.45	70.55	71.65
1988	72.90	75.41	79.88	74.11
1989	65.87	83.89	88.26	95.64
1990	86.40	80.66	76.64	75.24
1991	85.57	88.90	92.42	91.40
1992	89.82	89.87	88.73	91.01
1993	87.41	88.51	82.69	83.80
1994	78.75	80.71	75.63	76.20
1995	87.03	96.88	106.06	106.11
1996	95.79	81.37	77.90	78.51
1997	67.42	65.14	--	--

-- = not available.

Table 10—Volume of chips, by quarter, exported from Anchorage Customs District

Year	Quarter			
	1st	2d	3d	4th
	Short tons			
1970	–	–	–	–
1971	9,800	9,800	–	–
1972	20,185	–	–	–
1973	–	–	–	–
1974	10,725	87	21,816	2,200
1975	13,308	6,984	10,523	1,584
1976	17,252	18,658	39,554	32,188
1977	10,083	38,868	40,610	17,868
1978	11,807	11,138	8,922	–
1979	7,921	13,911	31,505	30,369
1980	30,649	57,860	40,103	22,716
1981	10,534	--	33,499	33,616
1982	--	27,430	32,404	14,330
1983	6,645	--	--	--
1984	11,609	--	--	4,916
1985	--	--	--	--
1986	--	--	--	--
1987	--	--	--	252
1988	208	--	11,297	--
1989	14,034	48,066	23,766	--
1990	--	4,199	15,819	8,265
1991	61,692	13,214	13,561	12,900
1992	--	--	8,589	6,921
1993	--	17,641	21,008	17,641
1994	42,092	6,610	9,807	14,994
1995	46,626	25,075	36,171	38,405
1996	65,782	49,286	30,452	54,343
1997	21,149	14,230	--	--

-- = not available.

Table 11—Nominal value of chips, by quarter, exported from Anchorage Customs District

Year	Quarter			
	1st	2d	3d	4th
	Dollars per short ton			
1970	–	–	–	–
1971	27.55	28.57	–	–
1972	25.76	–	–	–
1973	–	–	–	–
1974	26.57	24.14	28.07	50.00
1975	39.94	65.01	47.51	54.29
1976	53.83	45.82	34.29	29.16
1977	46.55	43.18	61.80	50.00
1978	37.94	34.87	39.12	–
1979	37.31	45.21	61.55	39.73
1980	83.49	49.94	97.34	91.76
1981	48.05	–	86.29	68.98
1982	–	56.53	77.99	72.44
1983	34.67	–	–	–
1984	28.53	–	–	46.51
1985	–	–	–	–
1986	–	–	–	–
1987	–	–	–	45.52
1988	48.08	–	48.69	–
1989	49.88	34.74	52.60	–
1990	–	31.91	81.23	86.15
1991	60.46	111.02	100.95	104.11
1992	–	–	23.64	19.36
1993	–	113.38	104.67	113.37
1994	104.13	104.08	116.75	116.98
1995	108.54	129.83	202.37	116.73
1996	96.53	89.42	72.51	69.59
1997	66.95	62.75	–	–

-- = not available.

Table 12—Real value of chips, by quarter, exported from Anchorage Customs District

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1970	–	–	–	–
1971	76.53	78.49	–	–
1972	69.06	–	–	–
1973	–	–	–	–
1974	59.84	50.19	54.61	94.34
1975	69.84	112.47	80.47	90.98
1976	89.76	75.30	55.68	46.92
1977	73.29	66.39	94.90	75.89
1978	56.22	50.17	55.43	–
1979	49.88	58.37	77.06	48.05
1980	96.48	56.58	106.74	98.36
1981	50.01	–	87.22	69.80
1982	–	56.53	77.99	72.44
1983	34.54	–	–	–
1984	27.61	–	–	44.93
1985	–	–	–	–
1986	–	–	–	–
1987	–	–	–	43.71
1988	45.92	–	45.12	–
1989	44.97	30.82	46.81	–
1990	–	26.05	66.11	70.69
1991	51.50	95.76	86.90	89.39
1992	–	–	19.98	16.37
1993	–	94.75	87.96	95.51
1994	87.58	86.76	96.01	95.68
1995	87.34	102.19	160.61	93.06
1996	76.37	70.24	57.00	54.37
1997	51.94	49.06	–	–

-- = not available.

Table 13—Real value (seasonally adjusted), by quarter, of chips exported from Columbia-Snake Customs District

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1968	–	65.74	64.05	65.75
1969	62.62	62.52	58.34	57.91
1970	56.42	54.88	53.47	55.91
1971	56.75	57.40	56.89	57.74
1972	58.59	58.52	57.40	61.21
1973	61.83	61.86	60.13	61.60
1974	61.47	54.67	52.57	51.29
1975	52.38	59.22	58.30	63.88
1976	66.54	65.80	65.14	67.42
1977	67.62	67.10	64.21	64.77
1978	64.30	61.78	57.98	57.49
1979	55.43	54.34	57.47	70.09
1980	87.51	99.19	100.54	100.12
1981	92.56	87.82	83.51	85.77
1982	85.91	83.72	78.07	77.01
1983	72.74	67.67	63.95	64.26
1984	66.13	68.99	69.37	73.76
1985	74.52	72.31	70.37	72.12
1986	73.25	72.51	70.28	72.03
1987	71.68	71.17	68.43	70.95
1988	73.01	73.17	70.10	74.70
1989	80.73	86.27	89.38	91.31
1990	86.74	80.29	77.65	81.94
1991	86.63	90.34	88.79	91.88
1992	92.29	91.52	88.76	90.68
1993	90.13	88.13	84.60	86.37
1994	86.72	85.30	83.67	89.22
1995	97.92	103.99	104.30	103.57
1996	94.47	86.00	75.88	75.31

-- = not available.

Table 14—Real value (seasonally adjusted), by quarter, of chips exported from Seattle Customs District

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1968	–	–	68.01	65.38
1969	68.98	71.77	68.99	63.18
1970	60.53	55.85	56.33	52.95
1971	50.45	48.40	49.25	46.95
1972	50.94	51.80	51.20	48.76
1973	50.03	52.05	52.74	52.59
1974	55.43	56.41	61.92	62.64
1975	63.65	66.48	67.48	61.28
1976	59.68	58.61	61.07	64.89
1977	73.63	75.25	71.62	69.18
1978	69.18	67.52	69.57	63.33
1979	64.31	64.40	64.65	69.49
1980	79.36	86.23	90.02	86.75
1981	83.18	81.65	85.50	79.82
1982	82.78	80.02	77.44	74.42
1983	73.64	73.28	73.88	69.69
1984	71.73	74.74	76.33	74.97
1985	75.76	74.64	75.92	73.88
1986	76.55	75.42	76.40	74.35
1987	75.31	77.73	78.92	77.26
1988	83.61	83.91	81.14	78.93
1989	74.25	77.45	81.62	77.59
1990	82.34	79.60	81.00	80.27
1991	85.83	89.30	91.12	87.34
1992	86.85	86.98	86.45	84.00
1993	84.35	81.03	77.41	69.74
1994	67.11	64.02	68.60	72.43
1995	81.04	89.65	90.49	82.52
1996	81.58	75.86	70.63	62.51

-- = not available.

Table 15—Real value (seasonally adjusted), by quarter, of chips exported from Pacific Northwest customs districts

Year	Quarter			
	1st	2d	3d	4th
	1982 dollars per short ton			
1968	–	–	65.14	65.59
1969	63.23	63.25	60.01	58.35
1970	57.06	54.81	54.30	55.32
1971	53.79	54.16	54.60	54.54
1972	57.83	57.79	57.57	60.10
1973	60.83	60.86	60.14	60.53
1974	60.74	54.92	54.50	52.85
1975	53.92	60.02	59.74	63.16
1976	64.90	64.07	64.64	66.41
1977	67.99	67.58	65.45	64.90
1978	64.47	62.04	59.52	57.87
1979	56.14	55.05	58.85	69.84
1980	86.83	97.75	100.66	98.80
1981	91.42	86.90	84.44	84.80
1982	85.28	82.79	78.51	76.35
1983	72.59	68.14	65.71	64.78
1984	66.65	69.42	70.79	73.75
1985	74.49	72.32	71.79	72.33
1986	73.69	72.80	71.79	72.45
1987	72.29	72.19	71.15	72.59
1988	75.66	75.69	73.06	75.90
1989	78.77	83.54	87.64	87.70
1990	85.63	79.86	78.71	81.55
1991	86.33	89.71	89.70	90.83
1992	90.80	89.99	88.34	88.87
1993	88.22	85.73	82.58	81.45
1994	80.47	77.94	79.07	83.90
1995	92.40	99.17	100.17	97.29
1996	91.14	83.52	75.52	72.21

-- = not available.

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